

What Is Claimed Is:

Sub A1

1. A dual pumping element fluid pump system comprising:
 - a primary pump element having an intake port that receives fluid from a fluid supply and a discharge port;
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 - a secondary pump element having an intake port that receives fluid from a fluid supply and a discharge port;
 - a fluid flow control valve that is in fluid
10 communication with said primary pump element and said secondary pump element and movable between a normally open position and a closed position;
 - a recirculation passageway that connects said
15 secondary pump element discharge port with said secondary pump element intake port;
 - a leak back mechanism allowing fluid to flow around or through said valve to said recirculation circuit to prevent cavitation or overheating of said secondary pump element;
 - 20 wherein when said system is operating at low speeds, said fluid control valve is in said normally open position and said system is provided with fluid from said primary pump element discharge port and said secondary pump element discharge port; and
 - 25 wherein when said system is operating at high speeds said fluid flow control valve is moved to said closed position directing said fluid from said secondary pump element discharge port through said recirculation passageway to said secondary pump element intake port.

2. The system of claim 1, wherein said fluid control valve includes a first plunger portion that blocks fluid flow from said fluid supply to said secondary pump element inlet port and a second plunger portion that blocks fluid flow from said secondary pump element discharge port to a load when said fluid control valve is moved to said closed position.

3. The system of claim 2, wherein said leak back mechanism includes at least a pair of bleeder notches formed in said valve body to allow fluid to leak back from said load into said recirculation passageway.

4. The system of claim 2, wherein said leak back mechanism includes at least a pair of bleeder notches formed in said second plunger portion to allow fluid to leak back from said load into said recirculation passageway.

5. The system of claim 2, wherein said leak back mechanism includes a hole or plurality of holes formed in said second plunger portion to allow fluid to leak back from said load into said recirculation passageway.

6. The system of claim 2, wherein said leak back mechanism includes an annular groove or plurality of grooves formed in said second plunger portion to allow fluid to leak back from said load into said recirculation passageway.

7. The system of claim 2, wherein said fluid control valve moves from said open position to said closed position within a valve housing.

8. The system of claim 7, wherein said leak back mechanism includes a bleeder notch in said valve formed body around said second plunger portion to allow fluid to leak back from said load to said recirculation passageway.

9. A method of pumping fluid to an engine, comprising:

providing a primary pump element with an intake port and a discharge port;

providing a secondary pump element with an intake port and a discharge port;

providing a flow control valve that is movable between a normally open position and a closed position in a valve housing;

discharging fluid to the engine through said primary pump element discharge port and said secondary pump element discharge port when the pressure in the engine is below a predetermined threshold;

moving said flow control valve to a partially closed position when the pressure in the engine reaches said predetermined threshold;

moving said flow control valve to said closed position when the pressure in the engine exceeds said predetermined threshold;

connecting said secondary pump element intake port with said secondary pump element discharge port, and blocking fluid flow from a fluid supply to said

secondary pump element inlet port, when said flow control valve is in said closed position, such that the engine is provided with fluid through only said primary pump element discharge port; and

- 5 providing a leak back mechanism to allow fluid to flow to said secondary pump element when said flow control valve is in or near said closed position.

10 10. The method of claim 9, further comprising providing a plurality of plunger portions with a first plunger portion of said flow control valve blocking fluid flow from said fluid supply to said secondary pump element inlet port.

15 11. The method of claim 10, wherein said leak back mechanism is formed by providing bleeder notches in said valve housing to allow leak back around a second plunger portion that blocks fluid flow from said secondary pump element discharge port to the engine.

20 12. The method of claim 10, wherein said leak back mechanism is formed by providing bleeder notches in a second plunger portion of said flow control valve, that blocks fluid flow from said secondary pump element discharge port to the engine, to allow leak back around said second plunger portion.

25 13. The method of claim 10, wherein said leak back mechanism is formed by providing at least one annular groove in said plunger portion to allow leak back around said second plunger portion which blocks

fluid flow from said secondary pump element discharge port to the engine.

14. The method of claim 10, wherein said leak back mechanism is formed by providing at least one
5 passage through a second plunger portion to allow leak back through said second plunger portion which blocks fluid flow from said secondary pump element discharge port to the engine.

15. The method of claim 10, wherein said leak
10 back mechanism is provided by substantially closing a second plunger portion that blocks fluid flow from said secondary pump element discharge port to the engine such that a small passage remains between a second plunger portion and said valve housing to allow leak back
15 therethrough.

16. A dual pumping element fluid pump system, comprising:

a primary pump element having an intake port that receives fluid from a fluid supply and a discharge
20 port that provides fluid to a load;

a secondary pump element having an intake port that receives fluid from a fluid supply and a discharge port;

a fluid flow control valve that is in fluid
25 communication with said primary pump element and said secondary pump element, said fluid flow control valve having a valve member that is moveable within a valve housing between an open position and a closed position;

said fluid control valve member having a plurality of plunger portions that direct the flow of fluid to and from said secondary pump element;

5 a leak back mechanism formed in or around said fluid flow control valve to allow fluid to flow to said secondary pump element when said valve member is in or near said closed position;

10 wherein when said system is operating at low speeds, said valve member is in said open position and said load is provided with fluid from said primary pump element discharge port and said secondary pump element port; and

15 wherein when said system is operating at high speeds said valve member is moved to said closed position with a first plunger portion blocking communication between the secondary pump's intake port and said fluid supply and a second plunger portion blocking a passage in said valve body preventing fluid from flowing from said secondary pump element discharge
20 port to said load and directing said fluid through a recirculation passageway from said secondary pump element discharge port to said secondary pump element intake port.

17. The system of claim 16, wherein said leak
25 back mechanism includes a plurality of bleeder notches formed in said valve housing to allow leak back of fluid to said recirculation passageway.

18. The system of claim 16, wherein said leak back mechanism includes a plurality of bleeder notches

formed in said second plunger portion to allow leak back of fluid to said recirculation passageway.

19. The system of claim 16, wherein said leak back mechanism includes an annular groove formed in said
5 second plunger portion to allow leak back of fluid to said recirculation passageway.

20. The system of claim 16, wherein said leak back mechanism includes at least one passageway formed through said second plunger portion to allow leak back
10 of fluid to said recirculation passageway.

21. The system of claim 16, wherein said leak back mechanism includes an opening formed between said second plunger portion and said valve housing to allow leak back of fluid to said recirculation passageway.

22. The system of claim 16, wherein said
15 primary pump element is in communication with a primary shaft of a balance shaft system whereby low speed noise control costs are minimized.

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